

In the Claims

Please amend claims 78, 87, 88, 92 and 97.

Following is a clean version of the amended claim and a clean version of all the pending claims. In addition, a marked version of the amended claims showing the changes follows the Remarks section.

Clean Version Of Amended Claims

02
Sub P1
78. (seven times amended) An apparatus for testing a semiconductor die having a plurality of pads comprising:

a plate;

a substrate on the plate comprising a plurality of contacts configured to electrically contact the pads;

a clamping mechanism attached to the plate configured to bias the contacts and the pads together with a force;

the plate, the substrate and the mechanism configured such that the die can be placed on the substrate, the mechanism attached to the plate, and the die retained between the mechanism and the substrate with the contacts in electrical contact with the pads; and

each contact comprising a bump comprising a metal deposited on the substrate and a plurality of spaced raised points having a height and comprising portions of the metal dimensioned to penetrate into a pad to a penetration depth equal to the height but less than a thickness of the pad, the bump dimensioned to limit further penetration of the points into the pad at the force, the height and the penetration depth being from one half to two thirds of the thickness.

03
87. (six times amended) An apparatus for testing a semiconductor die having a plurality of pads comprising:

a plate comprising a plurality of external leads;

a substrate on the plate comprising a plurality of contacts configured to electrically contact the pads;

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D3
a clamping mechanism attached to the plate configured to bias the contacts and the pads together with a force;

the plate, the substrate and the mechanism configured such that the die can be placed on the substrate, the mechanism attached to the plate, and the die retained between the mechanism and the substrate with the contacts in electrical contact with the pads;

each contact comprising a bump comprising a metal and a plurality of spaced points having a height and comprising portions of the metal configured to penetrate into a pad with a penetration depth equal to the height but less than a thickness of the pad while a remainder of the bump limits further penetration, the height and the penetration depth being at least 5000Å but less than two thirds of the thickness, the force selected to be greater than a first force at which the points penetrate the pad but less than a second force at which the remainder of the bump penetrates the pad, the second force being from two to ten times the first force.

88. (five times amended) The apparatus of claim 87 wherein the height is 5000Å.

D4
92. (five times amended) An apparatus for testing a semiconductor die having a plurality of pads comprising:

a plate;

a substrate on the plate comprising a plurality of contacts configured to electrically contact the pads;

a clamping mechanism attached to the plate configured to bias the contacts and the pads together with a force;

the plate, the substrate and the mechanism configured such that the die can be placed on the substrate, the mechanism attached to the plate, and the die retained between the mechanism and the substrate with the contacts in electrical contact with the pads;

each contact comprising a bump having a surface and a plurality of spaced points comprising portions of the bump projecting from the surface dimensioned to penetrate into a pad at the force by a penetration depth equal to a height of the raised portions but less than a thickness of the pad while the surface limits further penetration into the pad, the height and the penetration depth being at least 5000Å but less than two thirds of the thickness, the force selected to be greater than a first force at which the points penetrate the pad but less than a second force at which the bump penetrates the pad.

97. (amended) An apparatus for testing a semiconductor die having a pad with a thickness comprising:
a plate;

a substrate on the plate comprising a contact configured to electrically contact the pad, the contact comprising a bump having a surface and at least one point comprising a portion of the bump projecting from the surface with a height of at least 5000Å, the point and the surface configured such that the point can penetrate into the pad to a penetration depth equal to the height but less than about two thirds of the thickness while the surface limits further penetration into the pad; and

a clamping mechanism attached to the plate configured to bias the die and the substrate together with a force selected to achieve penetration of the pad by the point but to prevent damage to the pad by the bump.

Clean Version Of All Pending Claims

06
78. (seven times amended) An apparatus for testing a semiconductor die having a plurality of pads comprising:

a plate;

a substrate on the plate comprising a plurality of contacts configured to electrically contact the pads;

a clamping mechanism attached to the plate configured to bias the contacts and the pads together with a force;

the plate, the substrate and the mechanism configured such that the die can be placed on the substrate, the mechanism attached to the plate, and the die retained between the mechanism and the substrate with the contacts in electrical contact with the pads; and

each contact comprising a bump comprising a metal deposited on the substrate and a plurality of spaced raised points having a height and comprising portions of the metal dimensioned to penetrate into a pad to a penetration depth equal to the height but less than a thickness of the pad, the bump dimensioned to limit further penetration of the points into the pad at the force, the height and the penetration depth being from one half to two thirds of the thickness.

79. (five times amended) The apparatus of claim 78 wherein the bump is dimensioned to penetrate into the pad at a second force which is about two to ten times the force.

80. (five times amended) The apparatus of claim 78 further comprising a plurality of conductive traces on the substrate in electrical communication with the contacts, and a plurality of external contacts on the plate in electrical communication with the traces.

81. (five times amended) The apparatus of claim 78 wherein the height is about 5000Å.

82. (five times amended) The apparatus of claim 78 wherein the pads comprises bondpads.

01
87. (six times amended) An apparatus for testing a semiconductor die having a plurality of pads comprising:
a plate comprising a plurality of external leads;
a substrate on the plate comprising a plurality of contacts configured to electrically contact the pads;
a clamping mechanism attached to the plate configured to bias the contacts and the pads together with a force;
the plate, the substrate and the mechanism configured such that the die can be placed on the substrate, the mechanism attached to the plate, and the die retained between the mechanism and the substrate with the contacts in electrical contact with the pads;
each contact comprising a bump comprising a metal and a plurality of spaced points having a height and comprising portions of the metal configured to penetrate into a pad with a penetration depth equal to the height but less than a thickness of the pad while a remainder of the bump limits further penetration, the height and the penetration depth being at least 5000Å but less than two thirds of the thickness, the force selected to be greater than a first force at which the points penetrate the pad but less than a second force at which the remainder of the bump penetrates the pad, the second force being from two to ten times the first force.

08
88. (five times amended) The apparatus of claim 87 wherein the height is 5000Å.

90. (four times amended) The apparatus of claim 87 wherein the bump comprises a surface and the raised portions project from the surface.

91. (four times amended) The apparatus of claim 87 further comprising a plurality of bond pads on the conductive traces.

09 92. (five times amended) An apparatus for testing a semiconductor die having a plurality of pads comprising:

a plate;

a substrate on the plate comprising a plurality of contacts configured to electrically contact the pads;

a clamping mechanism attached to the plate configured to bias the contacts and the pads together with a force;

the plate, the substrate and the mechanism configured such that the die can be placed on the substrate, the mechanism attached to the plate, and the die retained between the mechanism and the substrate with the contacts in electrical contact with the pads;

each contact comprising a bump having a surface and a plurality of spaced points comprising portions of the bump projecting from the surface dimensioned to penetrate into a pad at the force by a penetration depth equal to a height of the raised portions but less than a thickness of the pad while the surface limits further penetration into the pad, the height and the penetration depth being at least 5000Å but less than two thirds of the thickness, the force selected to be greater than a first force at which the points penetrate the pad but less than a second force at which the bump penetrates the pad.

93. (four times amended) The apparatus of claim 92 further comprising a plurality of external leads on the plate in electrical communication with the contacts.

96. (four times amended) The apparatus of claim 92 wherein the raised portions comprise points.

97. (amended) An apparatus for testing a semiconductor die having a pad with a thickness comprising:
a plate;

a substrate on the plate comprising a contact configured to electrically contact the pad, the contact comprising a bump having a surface and at least one point comprising a portion of the bump projecting from the surface with a height of at least 5000Å, the point and the surface configured such that the point can penetrate into the pad to a penetration depth equal to the height but less than about two thirds of the thickness while the surface limits further penetration into the pad; and

a clamping mechanism attached to the plate configured to bias the die and the substrate together with a force selected to achieve penetration of the pad by the point but to prevent damage to the pad by the bump.

98. The apparatus of claim 97 wherein the contact comprises a plurality of raised portions and the raised portions comprise pointed members.